

# Formal Reasoning

## 2-Logic

- **Deductive Reasoning**
- Drawing conclusions from a set of observations or premises.
- If the premises are true, the conclusion must also be true.
- **Inductive Reasoning**
- Draw conclusions but could be conceivably wrong.
- You draw **specific conclusions** from **general premises**.

# Formal Reasoning

## 2-Logic

- Deductive Reasoning
- Inductive Reasoning
- Example:
  - All human beings are mortal. I am a human being.
  - If the premises are true
  - Then, I am mortal.
- Example:
  - Most people with season tickets must love music. John has season tickets.
  - Then, John probably loves music.

# Formal Reasoning - 2 - Logic

## • Deductive Reasoning

### Examples:

- 1. All oranges are fruits  
2. All fruits grow on trees  
3. Therefore, all oranges grow on trees
- The soccer game is on either Thursday or Friday. I just found out that the game is not on Thursday, so the game must be on Friday.
- If the two premises really are true, then there is no possible way that the conclusion could be false.

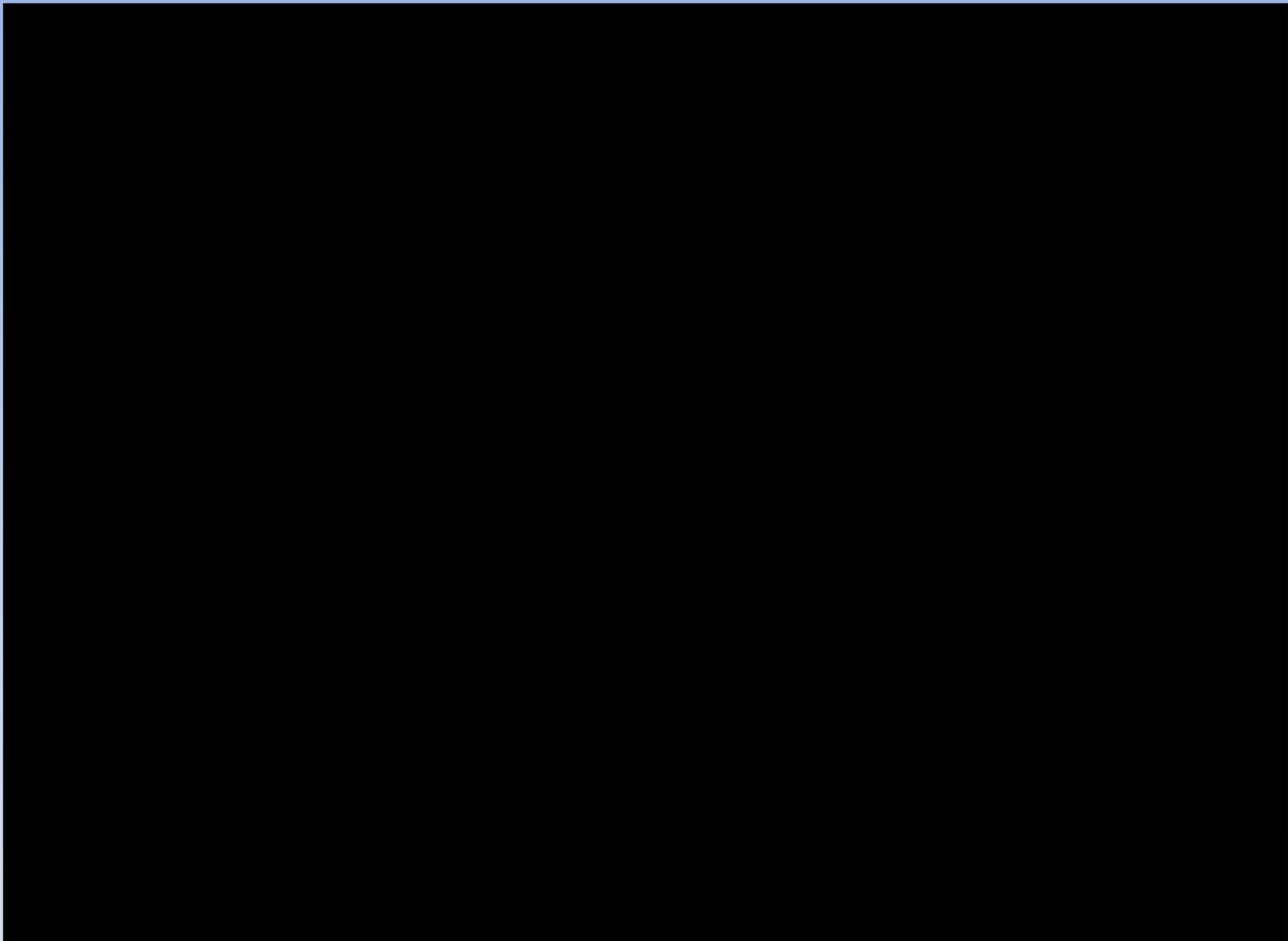
## • Inductive Reasoning

### Example:

- All the tigers observed in a particular region have yellow black stripes, therefore all the tigers native to this region have yellow stripes
- My dog has never bitten me, so dogs don't bite.
- Even if all the premises are true, it is still possible that the conclusion is false.

January has always been cold here in Siberia. Today is January 14, so it is going to be another cold day in Siberia.

This argument is inductive. The premises makes the conclusion likely, but they do not guarantee that the conclusion is true. To put the point another way, it is possible that the premises of this argument could be true and the conclusion could still be false. One can, for example, imagine a freak warm day in Siberia on January 14.



# Informal Reasoning

- In informal reasoning problems, there may be no clearly correct solutions.
- **Disagreement** may exist about basic premises.
- Information may be **incomplete**.
- Many **view points** may compete.

# Informal Reasoning

## 1-Heuristics



- A rule-of-thumb strategy that often allows us to make judgments and solve problems efficiently.
- A short cut (that can be prone to errors).
- **Examples:**
- A doctor who wants to determine the best kind of treatment.
- A factory owner who wants to boost production.

Who would you trust to baby-sit your child?



# Heuristics

S P L O Y O C H Y G  
B S V G H O E A E Y

Put a Y at the end, and see if the word  
begins to make sense.

# Informal Reasoning

## 2-Dialectical Thinking

- Consider thesis and antithesis simultaneously to arrive at synthesis.
  - (most advanced critical thought process.)
- **Example:**
- It is what juries are supposed to do in order to arrive to a verdict.
  - You consider argument for and against the defendant's guilt.
  - You consider point and counter point.

# Barriers to Reasoning

What are some obstacles to problem solving?



# Barriers to Reasoning

- 1- Availability Heuristic  
Exaggerating the Improbable
  - Estimating the likelihood of events based on their availability in memory. We assume such events are common.
  - Vivid cases in the news often cause an availability heuristic.
- **Example:**
  - If it happened in the past, then it will happen now.
  - I had an accident on the freeway, then I can't drive on the freeway because I will get in an accident. (The memory of the accident is the most "available.")

# Moving Images

## Exploring Psychology Through Film

### Memory and Thought

False Memories

Estimating Risk

Animal Language

Intelligence

Main Menu

# Does this look good?



## Wait, what???



# Barriers to Reasoning

- 2- Representativeness Heuristic

Who went to Harvard?



My friend Dan is a smart dude, but did not go to Harvard (but he looks like he did).



- Judging a situation based on how similar the aspects are to the prototypes the person holds in their mind.
- Like thinking everyone from Decatur is preppy, or someone with glasses is nerdy, or a blonde is not smart.

- If I tell you that Sonia Dara is a Sports Illustrated swimsuit model, you would make certain quick judgments (heuristics) about her...like about her interests or intelligence.
- She is an economics / human evolutionary biology major at Harvard University.

# Representativeness Heuristic

Linda is 31, single, outspoken and very bright. She majored in philosophy in college. As a student, she was deeply concerned with discrimination and other social issues, and she participated in antinuclear demonstrations.

Which statement is more likely?

- a. Linda is a bank teller
- b. Linda is a bank teller and a feminist activist.

# The Availability and Representativeness Heuristics

**Table 3.1: The Availability and Representativeness Heuristics**

| Heuristic          | Definition  | Example   | Downside   |
|--------------------|---|---|--|
| Availability       | a rule used to estimate the likelihood of a given occurrence based on how easily one can recall an example of that occurrence | Fearing air travel more after the events of Sept. 11  | Giving more weight to the scarier, more vivid occurrences without fearing other, more likely instances |
| Representativeness | a rule used to estimate the likelihood of an event based on how well it fits with your expectations of a model for that event | Thinking that Jen is a librarian because she wears glasses and is considered to be an introvert | Ignoring other important information   |

Source: Based on Gigerenzer, G. (2004b). Fast and frugal heuristics: The tools of bounded rationality. In D. Koehler & N. Harvey (Eds.), *Blackwell handbook of judgment and decision making* (pp. 62–88). Oxford, UK: Blackwell.

# Barriers to Reasoning

- 3- Framing and the Tendency to Avoid Loss  
How an issue is framed can significantly affect decisions and judgments.
- **Examples:**
- If you take chemotherapy, you'll lose your hair. (People will respond cautiously)
- If you take the medication for high blood pressure, you'll be OK. (People will go for it)